IN THE UNITED STATES PATENT AND TRADEMARK OFFICE PATENT

In re the application of	)	
	)	
Bedell et al.	)	Group Art Unit: 1756
	)	
Application No. 10/733,097	)	Examiner: Chacko-Davis, Daborah
	)	
Filed: 12/10/2003	)	Attorney Docket No. HIT1P023/
	)	HSJ920030085US1
For: IMPROVED PLATING USING	)	
COPOLYMER	)	Date: March 5, 2007
	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ATTENTION: Board of Patent Appeals and Interferences

REPLY BRIEF (37 C.F.R. § 1.193)

This Reply Brief is being filed within two (2) months of the mailing of the Examiner's Answer mailed Jan. 12, 2007.

Following is an issue-by-issue reply to the Examiner's Answer.

Examiner's comments regarding section (7), "Claims Appendix," of the Appeal Brief.

Substantially agree, but wish to clarify that the claims on appeal are: 1-14, 36. The only *independent* claims on appeal are 1 and 36, as correctly noted by the Examiner.

Issue #1:

Issue # 1: Claims 1-8 and 13-14 stand rejected under 35 USC 103(a) as being unpatentable over US2001/0005741 to Breyta et al. (hereinafter "Breyta") in view of US5017271 to Whewell et al. (hereinafter "Whewell").

Group #1: Claims 1-8, 13-14

Claims 1-8, 13-14

In the Office Action dated May 15, 2006, claims 1-8 and 13-14 were rejected under 35 USC 103(a) as being unpatentable over Breyta in view of Whewell.

The analysis of obviousness was set forth in *Graham v. John Deere*, 383 U.S. 1, 148 USPQ 459 (1966). In order to establish a *prima facie* case of obviousness, three basic criteria must be met:

> First, there must be some *suggestion or motivation*, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the teachings of the references. Second, there must be a *reasonable expectation of success*. Finally, the prior art reference or combined references must teach or suggest *all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art*, and not based on applicant's disclosure (*In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991; emphasis added).

In the Appeal Brief filed Oct. 16, 2006, the rejection of claims 1-8 and 13-14 were respectfully traversed as failing the *Graham* test. Specifically, regarding claim 1 and its dependents, the combination proposed in the rejection fails the first element of the *Graham* test.

Regarding claims 1-8 and 13-14, it was argued in the Appeal Brief that there is no suggestion or motivation to combine the teachings of Breyta with Whewell, and that Whewell actually teaches away from plating using an underlayer.

The law relied on is as follows. A *prima facie* case of obviousness may be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. *In re Geisler*, 116 F 3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997) [emphasis added]. It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983).

Reply to Examiner's response A)

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner argued that Whewell was relied on to teach the deposition of the materials on the exposed portion of the substrate using plating techniques, and does not teach away from plating. However, this does not address the thrust of Applicants' argument, that Whewell teaches away from coating a substrate with a barrier layer, and coating the barrier layer with a top layer comprising a photoresist, in violation of the rule of *In re Giesler, supra*. Yes, Whewell does teach plating. But Whewell teaches away from plating processes such as those claimed by Applicants, for reasons set forth in the Appeal Brief and below in the reply to Examiner's response B) and C).

Futher, because Whewell not only teaches away from masking processes using an underlayer and undercut, but actually makes such an object of his invention (as set forth below), it is clear that Whewell teaches away from combination with Breyta. It is improper to combine references where the references teach away from their combination. *In re Grasselli, supra.*

The examiner also incorrectly states that plating using an underlayer is not recited in the claims. On the contrary, as recited in claim 1, the claimed barrier layer is an underlayer that is positioned between a top layer and the substrate, where a material is plated on an exposed portion of the substrate. Accordingly, the Examiner's argument that plating using an underlayer is not claimed is erroneous.

Reply to Examiner's response B)

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner argued that Whewell is not relied on to disclose the substrate with the barrier layer, and top coating comprising a photoresist layer, but rather is relied on to disclose the interchangeability of the plating and sputtering deposition

techniques. The Examiner goes on to state the Breyta is relied on to disclose coating a barrier layer (adhesive layer) on the substrate, and coating a top imaging layer of photoresist material on the adhesive layer.

In reply, it is argued that regardless of whether Whewell discloses interchangeability of plating and sputtering deposition techniques, this does not change the fact that Whewell teaches away from the claimed invention (as set forth below), as well as teaches away from its combination with Breyta (as set forth above), in violation of the rules of *In re Giesler* and *In re Grasselli, supra*.

As set forth in the Appeal Brief, Whewell teaches away from coating a substrate with a barrier layer, and coating the barrier layer with a top layer comprising a photoresist, as asserted in the rejection, and as required by the claimed invention. Particularly, Whewell clearly indicates that it is a purpose of his invention to eliminate such a layer between photoresist and a substrate. For example, Whewell states that "[t]he present invention also eliminates the need for a pre-treatment of the metallic surfaces prior to the application of the photoresist, and allows for better resolution in the photo imaging process." *See* Whewell col. 3, lines 26-30.

Perhaps even more compelling, Whewell goes on to indicate that such a pretreatment is not only unnecessary, but is actually undesirable. The rejection indicates that it would have been obvious to modify Breyta's using a plating process as suggested by Whewell. However, as shown in Breyta's FIGS. 2-3 and 6-7, an undercut is formed as part of the photoresist patterning process. Referring next to Whewell col 2, lines 26-34, Whewell states that masking processes such as that disclosed in Breyta are problematic. Particularly, Whewell states that underlayers under a photoresist mask result in formation of an undercut under the photoresist. This in turn results in conductive lines that do not possess rectangular dimensions. Particularly, such masks result in conductive lines that are curved inwardly. This in turn adversely affects the minimum size possible for manufacturing conductive lines. Accordingly, Whewell's invention "eliminates the need for a pre-treatment of the metallic surfaces prior to the application of the photoresist, and allows for better resolution in the photo imaging process." *See* Whewell col. 3, lines 26-31.

Applying the rule of *In re Geisler, supra*, it is clear that Whewell teaches away from plating in a process as claimed, where a barrier layer is positioned between the substrate and the photoresist, as to do so would result in poor definition of the conductive lines that are so critical to Whewell's invention.

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner also argued that Whewell discloses a chromium underlayer at col. 6, lines 38-46 of Whewell. However, upon examination of this section, it is seen that the chromium layer is actually a seed layer, with the photoresist formed directly thereon (i.e., no "barrier layer comprises an adhesive composition comprising a polyphenolic polymer" as claimed in claims 1 and 36).

Reply to Examiner's response C)

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner appears to have equated arguments in the Appeal Brief relating to Whewell eliminating the need for a pretreatment of the metallic surfaces prior to application of the photoresist to an argument that the references fail to show certain features of the invention. The response goes on to state that these features are not recited in the rejected claims.

In reply, it is pointed out that Whewell eliminating the need for a pretreatment of the metallic surfaces prior to application of the photoresist goes to the motivation to combine the teachings of the references. As set forth above, applying the rule of *In re Geisler, supra*, it is clear that Whewell teaches away from plating in a process as claimed, where a barrier layer comprising a polyphenolic polymer is positioned between the substrate and the photoresist, as to do so would result in poor definition of the conductive lines that are so critical to Whewell's invention.

Reply to Examiner's response D)

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner argues that Whewell does not teach away from plating, and masking processes using an underlayer and undercut.

In reply, it is again pointed out that Whewell clearly indicates that it is a purpose of his invention to eliminate a barrier layer between photoresist and a substrate. For example, Whewell states that

"[t]he present invention also eliminates the need for a pre-treatment of the metallic surfaces prior to the application of the photoresist, and allows for better resolution in the photo imaging process." *See* Whewell col. 3, lines 26-30.

Perhaps even more compelling, Whewell goes on to indicate that such a pretreatment is not only unnecessary, but is actually undesirable. The rejection indicates that it would have been obvious to modify Breyta's using a plating process as suggested by Whewell. However, as shown in Breyta's FIGS. 2-3 and 6-7, an undercut is formed as part of the photoresist patterning process. Referring next to Whewell col. 2, lines 26-34, Whewell states that masking processes such as that disclosed in Breyta are problematic. Particularly, Whewell states that underlayers under a photoresist mask result in formation of an undercut under the photoresist. This in turn results in conductive lines that do not possess rectangular dimensions. Particularly, such masks result in conductive lines that are curved inwardly. This in turn adversely affects the minimum size possible for manufacturing conductive lines. Accordingly, Whewell's invention "eliminates the need for a pre-treatment of the metallic surfaces prior to the application of the photoresist, and allows for better resolution in the photo imaging process." *See* Whewell col. 3, lines 26-31.

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner also argues that Whewell teaches at col. 3, lines 38-50 that electroplating techniques are necessary in overly undercut photoresist patterns.

In reply, it is noted that this section does not discuss *overly* undercut photoresist patterns as proposed by the Examiner, but rather techniques to *minimize* undercutting (undercuts being indicated as extremely undesirable in the previous paragraph of Whewell). *See* Whewell col. 2, lines 38-41. Thus, to the contrary of the interpretation proffered by the Examiner, the cited section of Whewell actually proposed a mechanism to avoid the undercut.

Issue #2:

Issue # 2: Claims 9-11 stand rejected under 35 USC 103(a) as being unpatentable over Breyta et al. in view of Whewell and further in view of US6866987 to Lee (hereinafter "Lee").

Group #1: Claim 9

In the Appeal Brief filed Oct. 16, 2006, the rejection of claim 9 was respectfully traversed as failing the *Graham* test. Specifically, regarding claim 9, the combination proposed in the rejection fails the third element of the *Graham* test.

Reply to Examiner's response

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner argued that Lee teaches that the underlayer remains after the exposure and development. The Examiner points to col. 3, lines 42-56 and Figs. 2 and 4, elements 12 (photoresist) and 25 (underlayer) to show that the exposed portion of the underlayer remains after patterning.

In reply, the pertinent limitations of claim 9 are set forth below (emphasis added):

> coating the barrier layer with a top layer comprising a photoresist;
> imagewise exposing the top layer to radiation;
> removing a portion of the top layer for exposing a portion of the barrier layer;
> removing the exposed portion of the barrier layer for exposing a portion of the substrate;
> wherein the exposed portion of the top layer is removed using a developer,
> wherein the developer does not remove the exposed portion of the barrier layer

As seen, claim 9 requires removing a portion of the top layer for exposing a portion of the barrier layer using a developer, wherein the developer does not remove the exposed portion of the barrier layer. In other words, portions of the top layer are removed to expose portions of the barrier layer. In sharp contrast, whatever is used to remove Lee's photoresist layer 12 also removes layer 25. Referring to Lee FIG. 2 and related description at col. 3, lines 28-64 (cited in part in the rejection), it is clear that the underlayer 25 is in fact removed with the photoresist layer 12 after exposure. As shown, after exposure, the photoresist layer 12 and underlayer 25 are

removed. Note with particularity Lee col. 3, lines 42-45, which states that "Layers 25 and 12 together form a bilayer which is treated as a single layer for purposes of exposure to radiation and subsequent development." Then, as noted at Lee col. 3, lines 54-56, etching of the underlayer 25 is allowed to continue to create an undercut, as shown in Lee FIG. 4. Accordingly, Lee does not teach or suggest that the underlayer 25 remains after radiation and development. Accordingly, the Examiner's argument is erroneous.

Group #2: Claims 10-11

In the Appeal Brief filed Oct. 16, 2006, the rejection of claims 10-11 was respectfully traversed as failing the third element of the *Graham* test.

Reply to Examiner's response

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner argued that Lee teaches that the underlayer is removed by RIE or milling.

In reply, it is again pointed out that, as mentioned above in the arguments in favor of claim 9, the underlayer 25 is removed as part of the developing process, not by RIE or milling. See Lee col. 3, line 54 to col. 4, line 8.

Further, referring to Lee col. 4, lines 9-15 (cited in the rejection), it is noted that this section refers to using the remaining photoresist 12 as a mask for etching and milling of a substrate 22, as shown in FIG. 4 (prior to milling or etching) and FIGS. 5-6 (after milling or etching). Accordingly, Lee does not teach or suggest that the underlayer 25 is removed by milling or etching.

Issue #3:

Issue # 3: Claim 12 stands rejected under 35 USC 103(a) as being unpatentable over Breyta in view of Whewell and further in view of US6218056 to Pinarbasi (hereinafter "Pinarbasi").

Group #1: Claim 12

In the Appeal Brief filed Oct. 16, 2006, the rejection of claim 12 was respectfully traversed as failing the third element of the *Graham* test.

Reply to Examiner's response

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner argued that Pinarbasi discloses a process by which no undercuts are formed, citing col. 6, lines 38-54 and Figs. 10-11 of Pinarbasi.

In reply, it is noted that claim 12 requires that removal of the exposed portion of the barrier layer does not create undercuts under the photoresist. The sections and Figures cited by the Examiner are all related to processing steps performed prior to removal of release layer 306. Referring to Fig. 12, showing removal of exposed portions of release layer 306, it is clearly seen that an undercut is formed. Accordingly, the Examiner's response is erroneous.

Issue #4:

Issue # 4: Claim 36 stands rejected under 35 USC 103(a) as being unpatentable over Breyta et al. in view of Whewell and further in view of US5006202 to Hawkins (hereinafter "Hawkins").

Group #1: Claim 36

In the Appeal Brief filed Oct 16, 2006, the rejection of claim 36 was respectfully traversed as failing the *Graham* test.

Reply to Examiner's response

In the Examiner's Answer mailed Jan. 12, 2007, the Examiner argued that Hawkins discloses a single layer.

In reply, it has been shown that claim 1 is allowable over the combination of Breyta and Whewell. Claim 36 contains limitations similar to claim 1. Accordingly, the rejection of claim 36

based on Breyta, Whewell and Hawkins suffers from the same deficiencies as the rejection of claim 1, and therefore is improper.

In reply, it is also argued that Whewell teaches away from its combination with Hawkins, thereby negating a prima facie case of obviousness per the rule of *In re Grasselli, supra*. It is improper to combine references where the references teach away from their combination. *In re Grasselli*. The rejection indicates that Hawkins discloses that the substrate is protected by a protective layer. Looking closer at the section of Hawkins cited in the rejection, it is seen that Hawkings actually uses two underlayers under the photoresist (masking layer and protective layer). Again, Whewell states that "[t]he present invention also eliminates the need for a pre-treatment of the metallic surfaces prior to the application of the photoresist, and allows for better resolution in the photo imaging process." *See* Whewell col. 3, lines 26-30. Thus, the rejection fails the *Graham* test. Reconsideration and allowance of claim 36 is respectfully requested.

In view of the remarks set forth hereinabove, all of the independent claims are deemed allowable, along with any claims depending therefrom.

In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at (408) 971-2573. For payment of any additional fees due in connection with the filing of this paper, the Commissioner is authorized to charge such fees to Deposit Account No. 50-2587 (Order No. HSJ920030085US1).

Respectfully submitted,

By: /Dominic M. Kotab/ Date: March 5, 2007

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